Stormwater Management Guidelines for Mangakotukutuku Stream Catchment
Disclaimer
This internal series report has been prepared for the use of Waikato Regional Council as a reference document and as such does not constitute Council’s policy.

Council requests that if excerpts or inferences are drawn from this document for further use by individuals or organisations, due care should be taken to ensure that the appropriate context has been preserved, and is accurately reflected and referenced in any subsequent spoken or written communication.

While Waikato Regional Council has exercised all reasonable skill and care in controlling the contents of this report, Council accepts no liability in contract, tort or otherwise, for any loss, damage, injury or expense (whether direct, indirect or consequential) arising out of the provision of this information or its use by you or any other party.
# Table of Contents

1 Introduction 2
2 Existing ecological value 3
3 Catchment management approach 4
4 Policy and planning provisions 5
  4.1 Waikato Regional Policy Statement 5
  4.2 Proposed Regional Policy Statement 5
  4.3 Waikato Regional Plan 6
  4.4 District Plan 6
5 Stormwater issues 8
  5.1 Stormwater quantity effects 8
  5.2 Stormwater quality effects 9
6 Stormwater management guidelines 11
References 13
Appendix A Vegetated gullies and riparian margins 14
1 Introduction

Mangakotukutuku Stream is a tributary of the Waikato River and is located in the south of Hamilton, refer to Figure 1 below. There is a network of tributaries draining to the Mangakotukutuku Stream, the majority of which are located in green field areas. The Mangakotukutuku Stream has three main branches which all originate outside the city before flowing for varying lengths through existing residential areas.

The Peacockes Branch of the Mangakotukutuku Stream catchment drains an area referred to as Peacockes Growth Cell by Hamilton City Council (HCC), and there is a Structure Plan for the area. HCC are in the early stages of developing a Catchment Management Plan for the new growth area.

Due to the known high ecological values of the Mangakotukutuku Stream, and the numerous examples of stressed streams that exist in Hamilton City, it is essential that a different approach is taken to managing the effects of urban stormwater runoff in this catchment.

These guidelines outline Waikato Regional Council’s suggested approach to managing stormwater in the Mangakotukutuku Stream catchment.

Figure 1  Site Location Plan – Peacockes Development Area
2 Existing ecological value

Studies of Hamilton urban streams indicate that the Mangakotukutuku Stream and several of its tributaries support atypically high ecological values relative to other city streams (Collier et al. 2009) in particular the branch of the stream draining the Peacockes area. Ecologically the Peacockes Branch of Mangakotukutuku Stream is considered to be amongst the best remaining urban streams in Hamilton City due to the relatively small percentage impervious area currently in that subcatchment (Collier & Clements 2010).

The Peacockes Branch supports all the eight native fish species known from Hamilton City streams, including the threatened giant kokopu, longfin eel and torrentfish (Aldridge et al. 2006). In particular the iconic giant kokopu is relatively common in some parts of the catchment. In particular they are found around sections of stream with dense vegetation and good pool habitat for adults and around the many spring-fed seepage streams which appear to provide refugia for juvenile fish.

Introduced fish species are rarely encountered, with Gambusia occasionally seen in open sections of the mainstem and koi carp absent from above Peacockes Road except in rare situations where high Waikato River levels inundate the culvert.

The culvert at Peacockes Road has recently had a fish ramp installed to improve upstream passage to the wider catchment for fish native species, and plans are being developed to remediate minor passage impedances at the Waterford Road culvert to enhance fish access to the Peacockes branch of the stream.

Stream macroinvertebrate values in the Peacockes Branch are exceptional for an urban stream; in particular for the short stretch of stream between Waterford Road and the mainstem in Sandford Park (Collier et al. 2009). This section of stream has gravel substrates, a moderate gradient and low upstream impervious area with much of the upstream channel confined to partially vegetated gullies; these features collectively maintain good water quality, flowing water and a variety of habitats for sensitive macroinvertebrates. Notably, the freshwater crayfish, a species that is sensitive to the effects of urbanisation, is abundant in some parts of the Peacockes Branch where vegetation cover and instream habitat provide cover and food. Moreover representation by sensitive mayfly and caddisfly taxa is high, comprising around 60% of invertebrate abundances and including up to eight taxa.

This is in sharp contrast to other streams in the city and surrounding agricultural landscape where these sensitive groups are rare and uncommon. In addition, sampling of adult caddisfly faunas has shown that the many spring-fed seepages that are disconnected from the stormwater network provide habitat for a wide range of caddisfly species that are normally associated with native forest stream environments (Smith 2007; Collier et al. 2009).
3 Catchment management approach

The Waikato Regional Council promotes a catchment-based approach to stormwater management, as set out below:

- **Values**: Identify the catchment and receiving environment values, including those which should be protected and enhanced;

- **Issues**: Identify actual and potential stormwater management issues, such as flooding, land instability, pollution from urban stormwater, high risk facility management, hazardous substances management, contaminated site management, urban development, the effects of urban stormwater on receiving environments.

- **Objectives**: Set stormwater management objectives for the catchment that relate to the catchment and receiving environment values, and identified stormwater management issues;

- **Options**: Present alternative stormwater management options and describe their consequences in terms of providing catchment-based management solutions to the issues identified, and achieving the set stormwater management objectives;

- **Methods**: Propose the preferred means for addressing stormwater management issues and implementing the preferred stormwater management solutions. Include the principle reasons for adopting the approach and the environmental results anticipated;

- **Catchment Management Plan**: Develop a Catchment Management Plan that provides the road map for how to manage stormwater effects within the context of the above listed assessment;

- **Implementation**: Implement the various catchment-based stormwater management initiatives and controls, as detailed in the Catchment Management Plan;

- **Monitoring**: Following implementation of the various catchment-based stormwater management initiatives and controls, carry out monitoring to confirm that the anticipated environmental benefits are realised.

Many stormwater effects are only significant when considered cumulatively. Small contributions of contaminants or gradual increases in flow through development may not be noticeable on a day to day basis. Over time these small increases in flow or contaminants collectively combine to give a noticeable and significant effect. The need to consider effects collectively necessitates the catchment-based approach, and requires potential urban development scenarios to consider the maximum credible development of a whole catchment as defined by the District Plan.
4 Policy and planning provisions

4.1 Waikato Regional Policy Statement

The Regional Policy Statement (RPS) was proposed in October 1993 and became operative in October 2000. The RPS provides an overview of the resource management issues in the Waikato Region, along with objectives and policies to achieve integrated management of the natural and physical resources of the Region.

The RPS recognises that urban stormwater runoff is a significant resource management issue (section 3.4.4), and that urban stormwater can be a significant point source discharge of untreated liquid wastes (section 3.9.3).

In order to manage the effects of the discharge of stormwater in an effective and integrated manner, Environment Waikato supports a catchment-based approach to stormwater management for existing urban areas, and for areas that may be urbanised in the future. This approach is set out in Part 3 of the RPS (sections 3.4.5, 3.4.6, 3.9.5 and 3.10.2).

On 25 November 2010, the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 came in to force in its entirety. From this date the vision and strategy is deemed to be part of the Operative Waikato Regional Policy Statement. The key objective of relevance to this guideline is "The restoration and protection of the Waikato River", this is considered to extend to apply to the tributaries of the Waikato River.

4.2 Proposed Regional Policy Statement

The Proposed Waikato Regional Policy Statement (PRPS) was publicly notified in November 2010, with submissions closing in February 2011. The PRPS reflects amendments to the RMA and changes in policy, economic and environmental direction over the past ten years since the first RPS became operative in 2000.

The key issues identified in the PRPS which relate to stormwater management, include the ‘state of resources’ (Issue 1.1), ‘effects of climate change’ (Issue 1.2), ‘managing the built environment’ (Issue 1.4), ‘relationship of tangata whenua with the environment’ (Issue 1.5), and ‘health of the Waikato River’ (Issue 1.6). There are also a number of overlapping objectives under each of these issues which are relevant to stormwater management, these include:

- Integrated management of natural and physical resources (Objective 3.1);
- Decision making (Objective 3.2);
- Health and wellbeing of the Waikato River (Objective 3.3);
- Adapting to climate change (Objective 3.5)
- Ecosystem services (Objective 3.7);
- Relationship of tangata whenua with the environment (Objective 3.8);
- Efficient use of resources (Objective 3.9);
- Built environment (Objective 3.11);
- Mauri and health of fresh water bodies (Objective 3.13);
- Ecological integrity and indigenous vegetation (Objective 3.18);
- Amenity (Objective 3.20);
- Natural character (Objective 3.21).
4.3 Waikato Regional Plan

The Waikato Regional Plan (WRP) implements the RPS and contains policy and methods to manage the natural and physical resources of the Waikato Region. Section 3.5 of the WRP provides for ‘Discharges’, setting out implementation methods that include specific activity rules for stormwater discharges (section 3.5.11).

Of particular relevance to this guideline is Section 3.1.2 Water Resources Objective:

*The management of water bodies in a way which ensures:*
  - net improvement of water quality across the Region
  - the avoidance of significant adverse effects on aquatic ecosystems

The first point recognises that the Waikato is a large, diverse region and water quality varies greatly. There are areas that have high or good water quality and there are areas that need improving. The quality of water can be adversely affected by the discharge of contaminants, which produces adverse effects such as decrease in amenity values, human health problems, and loss of flora and fauna. The net improvement objective sets a goal to achieve an overall improvement in water quality for the Region’s water bodies over time.

The second point reflects that aquatic ecosystems of the Region’s water bodies are a significant component of the natural resources and biodiversity of the Region. It is important to avoid significant adverse effects on aquatic ecosystems as they are linked to the fisheries and recreational values that the water bodies provide. Water quality values should not be allowed to further decline and this necessitates management actions related to future land use changes to arrest any decline in values.

Section 3.2.3 of the WRP outlines the policy in relation to the management of water bodies, and states the policy is to *Manage all water bodies to enable a range of water use activities, whilst ensuring that a net improvement in water quality across the Region is achieved over time...*

Policy 4 enables the use of all surface water bodies in the Region, provided that “*Any significant adverse effects on existing aquatic ecosystems are avoided, remedied or mitigated*”

4.4 District Plan

Territorial Local Authorities’ (TLA) functions under section 31 of the RMA include:

- a) “*The establishment, implementation and review of objectives, policies, and methods to achieve integrated management of the effects of the use, development and protection of land and associated natural and physical resources of the district;*

- b) *The control of any actual or potential effects of the use, development, or protection of land, including for the purpose of the avoidance or mitigation of natural hazards and the prevention or mitigation of any adverse effects of the storage, use, disposal, or transportation of hazardous substances of land;*

- c) *The control of subdivision of land.”*

Under section 442 of the Local Government Act, TLAs:
“May provide, cleanse, repair, and maintain all drainage works necessary for the efficient drainage of the district or part thereof.”

There is no statutory requirement, therefore, for TLAs to provide public stormwater drainage works but in practice the service is provided as a ‘public good’. In this respect, all discharge activities relating to stormwater drainage are subject to the provisions of the RMA and the relevant regional policy and planning instruments.

Hamilton City Council’s (HCC) Proposed District Plan sets out objectives and policies for subdivision and the development of urban land. HCC are currently working on a revised District Plan that includes Land and Water sections that outline the requirement for a catchment management approach. The revised District Plan is some years away from completion.
5 Stormwater issues

5.1 Stormwater quantity effects

Impervious surfaces created as a result of urban development such as roofs, driveways and carparks intercept rainfall and prevent infiltration directly to ground. The resultant runoff in conjunction with efficient conveyance systems flows at much higher rates and in larger quantities than corresponding 'natural' or 'undeveloped' catchments and hence alters the hydrological regime of the catchment. Reduced infiltration furthermore reduces recharge of groundwater aquifers and subsequent supply of base-flow to streams.

The effects of the alterations to the hydrological regime can include:

- Increased flooding hazard through the increased rate and volume of runoff from impervious surfaces, flood elevations can be increased;
- Increased stream bank erosion through increased peak flows causing instability of stream banks;
- Increased erosion on land and in the vicinity of stormwater outlets through the concentration of runoff flows;
- Diminished receiving environment health and diversity - brought about by alterations in the hydrological regime reducing aquatic ecosystem viability, habitat availability and downstream sedimentation effects;
- Reduced ground water resource and stream base-flows.

The values potentially affected by stormwater quantity effects include:

**Risks of flooding on people, property and the environment** – Increased runoff increases the risk of flooding in urban catchments and will impose a greater risk to human safety, property and the environment.

**Ecological and Habitat Values** – Increased uncontrolled runoff will result in increased erosion. Increases in stream bank erosion can be grouped as 'instream', being channel widening and undercutting of stream banks, and 'out-of stream' where slumping as a result of sheet flows and saturation of sloping land may occur. Increased erosion on land may also occur as a result of changes to the hydrological regime. All types of erosion raise sediment loads within receiving waters, potentially smothering aquatic flora and fauna and diminishing suitable habitat. Loss of riparian vegetation increases stream water temperatures, reduces aquatic food sources and increases stream erosion potential due to the lack of root bank armouring.

**Amenity Values** - The public's use and enjoyment of natural water bodies may be adversely affected due to the physical changes brought about from flooding, erosion and sedimentation. The resultant degradation can potentially affect recreational use and the aesthetic qualities of the water body.

**Tangata Whenua Values** - The significance of discharges to Tangata Whenua is that the contamination or degradation of water has the effect of diminishing the 'Mauri' or life force of receiving waters.

**Public Use** – Low flows potentially affect the water resource available to downstream water abstraction users.

The receiving waters of urban catchments may be modified by piping and/or the construction of engineered channels to improve drainage efficiency and reduce localised flood flows. These modifications can alter the ecological and habitat values of receiving waters by introducing barriers to instream fish migration, and by reducing or fragmenting suitable stream habitat. These modifications will also potentially affect other values such as those detailed above. The loss of these values can often be
avoided or mitigated through the careful design of appropriate stormwater management features.

5.2 Stormwater quality effects

A variety of urban land uses have the potential to generate contaminants which enter stormwater reticulation systems and discharge to receiving waters. These include:
- Transportation, storage, use and disposal of toxic and hazardous substances;
- Vehicle use and emissions;
- Earthworks during construction and urban development;
- Poor industrial and commercial site management practices;
- Poor domestic, commercial and industrial waste disposal practices;
- Runoff from roads, car parks, roofs and other paved surfaces;

Typical contaminants found in urban runoff include:
- Sediment;
- Metals (including zinc (Zn), copper (Cu), and lead (Pb));
- Oils and grease;
- Oxygen demanding substances (decomposition of organic debris);
- Nutrients (predominantly nitrogen and phosphorus);
- Pathogens (human and animal wastes);
- Litter;
- Others (e.g. pesticides, herbicides, waste paint and oils).

The resultant effects of contaminated stormwater entering receiving waters can include:
- Reduction in dissolved oxygen levels;
- Bacterial contamination of bathing waters and shellfish resources;
- A range of thermal impacts resulting from runoff discharges at elevated temperature levels;
- Smothering of bottom dwelling animals;
- Acute and chronic toxic impacts on sensitive organisms;
- Eutrophication;
- Aesthetic degradation.

The values potentially affected by stormwater quality effects include:

**Ecological and habitat values** - These can result from either acute or chronic impacts. Acute impacts relate to concentrations of a given contaminant being high enough to cause mortality while chronic impacts result from longer term accumulation of contaminants. Chronic impacts are commonly related to stormwater contaminants attached to particulates that tend to settle out in ‘depositional areas’ where the turbulence and energy in the water column is insufficient to keep sediments mobile. Accumulated contaminants in many of the receiving waters in the Waikato region are at levels where adverse effects on aquatic flora and fauna may be observed.

**Tangata whenua values** - The significance of discharges to Tangata Whenua relate to the contamination and degradation of water which has the effect of diminishing the 'Mauri' or life force of receiving waters.

**Amenity values** - The public's use and enjoyment of natural water bodies may be adversely affected due to the physiochemical changes brought about by contaminated stormwater entering these water bodies. The resultant degradation of water quality can potentially affect recreational use and the aesthetic qualities of the water body.
Public health/use – Microbiological contamination, particularly from wastewater sources, has potential public health risks for contact recreation activities, drinking water supplies, and fish consumption.

To avoid these adverse effects it is an imperative that urban stormwater is managed to mimic the natural hydrological cycle as much as possible. The following section outlines how this can be achieved for the Mangakotukutuku Stream catchment.
6 Stormwater management guidelines

In the Mangakotukutuku Stream catchment the following stormwater management approach is recommended to ensure adverse effects to the receiving environment are mitigated:

1. A treatment train approach is to be utilised, incorporating low impact design features. Opportunities for low impact design are to be explored, including clustering, minimising street surface areas, using swales for road runoff with cut kerbs, using infiltration trenches in central median strips, and raingardens in roundabouts, etc. Auckland Council's TP124 is a good reference for more information on low impact design.

2. Where downstream flooding is a concern it is recommended that peak flow control is provided, i.e. post development peak flows are throttled to pre-development peak flows for the 2 year Annual Recurrence interval (ARI) and 10 year ARI events. If downstream flood effects are known to occur then post development 100-year peak flow rates are to be throttled to 80% of the pre-development 100 year ARI peak flows.

3. Extended detention is to be provided to mitigate potential erosion and scour effects in the receiving environment (the first 34.5mm of rainfall is to be detained and released over the first 24 hours).

4. To achieve 3 above, it is recommended that all impervious surfaces drain to rain tanks, rain gardens, infiltration trenches or swales having underdrains with limited surface discharge for storms up to and including the 34.5 mm of runoff. This would allow for slow release of runoff over a 24-hour period and separate site runoff from overall catchment runoff.

5. If stormwater management features as outlined in 4 above cannot be incorporated into the built form due to poor ground conditions then it is recommended that wetlands are used in preference to stormwater ponds (wetlands are to be designed using NZTA's Stormwater Treatment Standard1). Where possible the outfall from the wetland should not discharge directly into the stream but a channel should be constructed for at least 20 metres to the stream where the intersection is approximately 45° to minimise turbulence at the junction. Energy dissipation should be provided at the wetland outfall to minimise erosion in the transition channel. The use of woody vegetation around the wetland perimeter and adjacent to a natural channel outfall from the wetland would also act to cool warmer water being discharged. The wetland should be densely planted along with a generous riparian margin to deter waterfowl, and children from entering the wetland.

6. Stormwater is to be treated to achieve water quality objectives (to remove a minimum of 75% of suspended solids).

7. It is recommended that a 20m offset be achieved from the point of stormwater discharge to the watercourse/perennial gully head being discharged to.

8. Existing riparian vegetation is to be protected. Areas that are vegetated are not be used for the placement of stormwater management features, i.e. gullies with vegetation. The figure in Appendix A shows the areas with existing vegetation which are to be considered "no-go" zones. It is recommended that existing riparian vegetation is protected and enhanced, and that unplanted riparian margins are planted with appropriate vegetation.

---

1 Or if a regionally specific stormwater guideline was produced that was endorsed by the Regional Council and Hamilton City Council then this would be used in preference to the NZTA Treatment Standard (May 2010).
9. It is recommended that soils be rehabilitated upon completion of construction to reduce adverse compaction impacts during the construction phase.

There are several guidelines on stormwater management that are used nationally, including:

- New Zealand Transport Agency’s Stormwater Treatment Standards (May 2010)


These documents provide details of how to design, construct and maintain stormwater treatment devices to achieve the objective listed above.

WRC has also produced a guideline on sustainable subdivision “Sustainable Subdivision Development – An Environment Waikato Perspective (Feb 2006)”, this is available from the Waikato Regional Council.

If a regionally specific stormwater guideline was produced that was endorsed by Waikato Regional Council then this would be used in preference to the above Auckland guidelines.
References


New Zealand Transport Agency (May 2010) Stormwater Treatment Standards

Appendix A
Vegetated gullies and riparian margins